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## MECHANICS.

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153. Proposed by W. J. GREENSTREET, M. A., Editor of The Mathematical Gazette, Stroud, England.

An equiangular polygon consisting of equal, freely jointed rods, is hung up from a vertex,  $A$ . The vertices adjacent to  $A$  are connected by a light rod of such a length that the polygon is still regular. Find the stress in the rod and the reactions at the vertices.

154. Proposed by M. E. GRÄBER, Graduate Student, Heidelberg University, Tiffin, Ohio.

Find the form of the curve in a vertical plane such that a heavy bar resting on its concave side and on a peg at a given point, (the origin), may be at rest in all positions.

## DIOPHANTINE ANALYSIS.

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113. Proposed by L. C. WALKER, A. M., Graduate Student, Leland Stanford Jr. University, Cal.

Find the four least integral numbers such that the difference of every two of them shall be a square number.

114. Proposed by J. E. SANDERS, Hackney, O.

Find the least integral values (if any) of  $a$ ,  $b$ , and  $c$  that will make  $2(a+b+c) \pm 2\sqrt{12ab-3(a+b-c)^2}$  a square number for either sign of the radical.

## AVERAGE AND PROBABILITY.

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140. Proposed by L. C. WALKER, A. M., Graduate Student, Leland Stanford Jr. University, Cal.

Obtain the average area of a triangle formed by a tangent to the four-cusped hypocycloid and the coordinate axes.

141. Proposed by F. P. MATZ, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

Upon a circular table, radius  $r$ , a *variable* square plate is thrown at random. What is the probability that the plate will lie wholly on the table?

## MISCELLANEOUS.

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135. Proposed by LON C. WALKER, A. M., Graduate Student, Leland Stanford Jr. University, Cal.

Find invariants of the *second*, *third*, and *sixth degrees* in the coefficients of a binary quartic.

136. Proposed by W. J. GREENSTREET, A. M., Editor of The Mathematical Gazette, Stroud, Eng.

(1) Solve (to five places) the equations,  $\sin(x+\frac{1}{4}\pi)=10\sin x$ , and  $a\cos\phi\log\sin\phi=p$  where  $a$  is small and positive, and  $\phi=a+\kappa$ , where  $\kappa$  is very small and  $a$  is not very small; (2) If  $a\theta=b\phi$  where  $a$  is prime to  $b$ , and  $\sin\theta=p$ ,  $\sin\phi=q$ , how many values of  $q$  are there for each of  $p$ ? (3) if  $2x=\sin^{-1}x$ , show there is only one positive value of  $x$ , and find it.